

Listing of Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-23. (Cancelled).

24. (Original) A method of lowering the dielectric constant and increasing the thermal stability and mechanical stability of a low k dielectric layer in an interconnect structure, comprising:

(a) providing a substrate with a metal layer comprised of metal lines having a top surface and sidewalls formed thereon and an anti-reflective coating (ARC) formed on the top surface of said metal lines;

(b) depositing an oxide layer comprised of one or more conformal oxide layers on said substrate, on the sidewalls of said metal lines, and on said ARC;

(c) depositing a low k dielectric layer comprised of an organosilicon material on said conformal oxide layer by a CVD, PECVD, or spin-on method;

(d) curing said low k dielectric layer;

(e) performing a first treatment comprised of a He plasma on said low k dielectric layer in a process chamber to form a transformed low k dielectric layer; and

(f) performing a second treatment comprised of a H₂ plasma on said transformed low k dielectric layer in a process chamber to form a composite low k dielectric layer comprised of a transformed low k dielectric layer that is enriched in Si-H bonds on a transformed low k dielectric layer that has a mechanically stabilized network of Si-O bonds.

25. (Original) The method of claim 24 further comprised of planarizing said composite low k dielectric layer.

26. (Original) The method of claim 24 wherein said ARC is a TiN layer.

27. (Original) The method of claim 24 wherein the low k dielectric layer is comprised of carbon doped silicon oxide, HSQ, and MSQ and has a thickness between about 1000 and 10000 Angstroms.
28. (Original) The method of claim 27 wherein the low k dielectric layer is a carbon doped silicon oxide layer which is SiCOH with a composition of about 15-18 atomic % Si, about 28-30 atomic % oxygen, about 16-18 atomic % carbon, and about 36-38 atomic % hydrogen.
29. (Original) The method of claim 24 wherein said first and second treatments each include a gas flow rate from about 1500 to 6000 sccm and have a duration from about 10 to 360 seconds.
30. (Original) The method of claim 24 wherein the chamber pressure during said first and second treatments is between about 1 mTorr and 20 Torr.
31. (Original) The method of claim 24 wherein the He plasma in said first treatment and the H₂ plasma in said second treatment is generated by applying a RF power between about 300 and 2500 Watts.
32. (Original) The method of claim 24 wherein said substrate is heated to a temperature between about 100°C. and 500°C. during said first and second treatments.
33. (Original) The method of claim 24 wherein said transformed low k dielectric layer enriched in Si-H bonds has a thickness from about 1000 to 3000 Angstroms.
34. (Original) The method of claim 24 wherein said first treatment and the second treatment are performed in the same process chamber.
- 35-52. (Canceled).